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| **Architecture Design** |
| Human Resource Management Project |
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| This document describes the architecture design for Human Resource Management (HRM) project. In this document, the view, including static view, physical view, and dynamic view will be shown. In addition, the data model will be described in this. |
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| **KIM TUONG** |
| **[Pick the date]** |
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**Revision History**

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| --- | --- | --- | --- |
| **Date** | **Version** | **Author** | **Description** |
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1. Documentation roadmap

# Scope

The purpose of this document is present the HRM system architecture under three perspectives. Three perspectives include:

* Static perspective
* Dynamic perspective
* Physical perspective

These perspectives are present base on the architectural drivers which have been identified in Architecture Design Document (ADD) document.

Besides, this document is present about quality attribute for HRM system. Two main quality attribute are:

* **Performance**:The response time of HRM system for each user interaction will be improved and the resource for each interaction will be reduced.
* **Security**: The HRM system will run safety. It cannot be accessed by unauthorized users, support detect the attacks and recover from the attack.
* **Usability:** The HRM system provide adequate user document including help, user manual and tutorials for user guidance.
* **Scalability:** The current system is just for about 10 users but it requires the system can expand more to 30- 40 users at a time.
* **Modifiability:** The HRM system supports the developers or maintainer can easy add new function or modify the current function whenever the business rules are change. The first release of HRM system just focuses on “Personal Information Management”. However, there will be more modules, which will be added to system in next release.
* **Availability**: The HRM will have periodically backup of database to ensure that whenever the database server is crashed, the data will not be lost.

# 1.2 Document organization:

This document includes three important parts:

**Part 1:** How to read this document

**Part 2:** System overview- The summarize of architectural drivers (High level requirement, quality attribute and constraint)

**Part 3:** View

*Physical* – How software and hardware interact with each other.

*Static* – The module of HRM system.

*Dynamic* – The interaction between HRM components.

The structure for presenting the view

**Session 1**: Primary presentation- The figure to present the view

**Session 2**: Element catalog – The table for describing the element which present in figure

**Session 3**: Element behavior- The flow of each component (This part is just for Dynamic perspective)

**Session 4:** Architecture background- Includes design decision and reasons for designing

1. System overview:

# 2.1 Project Overview

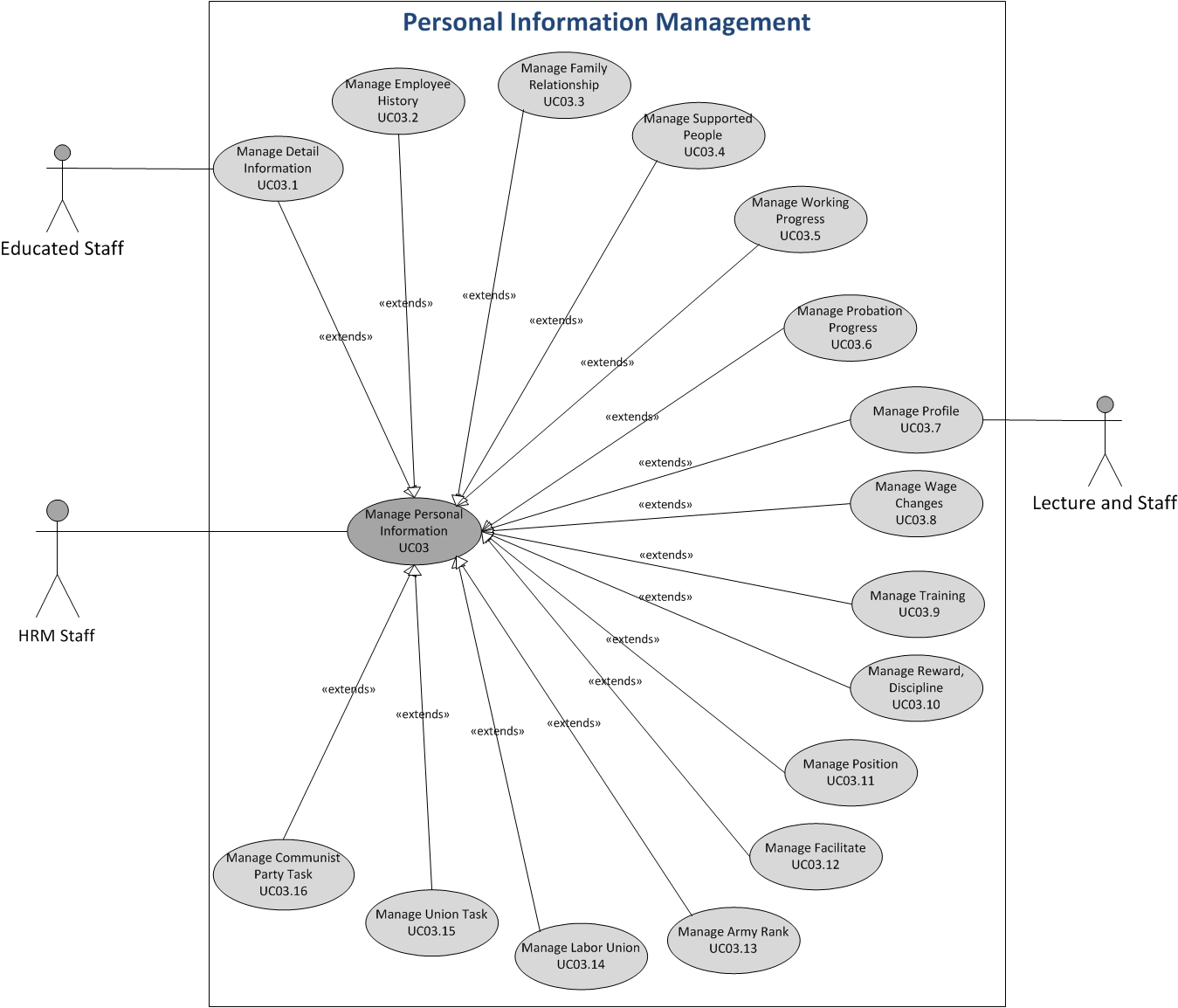
HRM is particularly developed for human resource management in university / colleges. The system consists of key modules:

* Personal information management
* Employee labor contract management
* Recruitment & training processing
* Payroll
* Administration panel – Utilities

# 2.2 Functional Requirement

Based on business rules and requirement, the list of functions in HRM system is listed in the following table. Based on the actor, we divided the function into 3 groups:

* Functions that related to administrator
* Functions that related to HRM Staff
* Functions that related to Lecture



*Figure 1: Use case of HRM project*

# 2.3 Quality Attribute Requirements

|  |  |  |  |
| --- | --- | --- | --- |
| **System quality attributes** | | | |
| **ID** | **Quality attributes** | **Description** | **View** |
| QA.01 | **PERFORMANCE** | The ability of HRM software to handle many user interactions (50 users) when the HRM staffs modify the Personal Information. The response time of HRM system for each user interaction will be improved about 3-4 seconds and the resource for each interaction will be reduced. | Stakeholder |
| QA.02 | **PERFORMANCE** | The performance when the user use browser to access for modifying the “Personal Information”. It allows the HRM staff to modify the information or lectures can update their profile everywhere only with browser. The response time for updating profile is about 4-6 seconds | Stakeholder |
| QA.03 | **PERFORMANCE** | The performance when the HRM staffs want to import the data (decision) to save in HRM system. The time for importing data is about 5 seconds for 500 rows and 20 columns.  The time for exporting data is about 5 seconds for 500 rows and 20 columns | Stakeholder |
| QA.04 | **SECURITY** | The HRM use WCF service so that the user will not know the path of database server and database is protected from attackers.  The HRM is also support the authentication function to assign the permission to users. Each user can access or see the button depend on their role. There are…. | Technical |
| QA.05 | **USABILITY** | -The HRM system have the consistent screens and easy to uses. In addition, the personal information is grouped into different category so that it will be easier to find the information  -The HRM system provide adequate user document including help, user manual and tutorials for user guidance  -HRM system supports to show multiple views. | Stakeholder |
| QA.06 | **SCALABILITY** | Now, the HRM system uses SQL Database server but the HRM can also run on other database MySQL | Stakeholder |
| QA.07 | **MODIFIABILITY** | The HRM system supports the developers or maintainer can easy add new function or modify the current function whenever the business rules are change. The first release of HRM system just focuses on “Personal Information Management”. However, there will be more modules, which will be added to system in next release, for example recruitment, insurance…modules | Technical |
| QA.08 | **MODIFIABILITY** | The HRM allows modifying the user interface (UI) includes the screen layout, text, GUI images… | Technical |
| QA.09 | **MODIFIABILITY** | The HRM allows modifying the client from using Silverlight to Windows Form (WPF) | Technical |
| QA.10 | **AVAILABILITY** | The HRM will have periodically backup of database to ensure that whenever the database server is crashed, the data will not be lost. In more detail, before crashing about 60 minutes, the server will warn and ask the user what data need to be backup to be able to work at home. | Technical |

1. System overview:

# Technical Constraints

|  |  |  |
| --- | --- | --- |
| **ID** | **Constraint name** | **Constraint Description** |
| TC.PIM.1 | Database | The system database will be developed using SQL server |
| TC.PIM.2 | Development framework | .Net 4.0, WCF, Silverlight, Entity framework |
| TC.PIM.3 | Network | Network is ADSL/Mega WAN |
| TC.PIM.4 | Programming language | Using C#, program and fix code on XML file or properties of XML file |
| TC.PIM.5 | Language | Default language is Vietnamese |
| TC.PIM.6 | Third-party | - Using Microsoft Word, Excel for documenting, importing, and exporting the data  -Using Telerik to design the interface |

# 3.2 Business Constraints

|  |  |  |
| --- | --- | --- |
| **ID** | **Constraint name** | **Constraint description** |
| BC.PIM.7 | Time limitation | The end of the project is in April 31st,2012 |

1. System Context:

|  |  |
| --- | --- |
| **Actor** | **Description** |
| Educated Department | * Manage issues related educated, papers educated. * Manage schedule teach hour, student, student transcript |
| Administrator | * Manage system, manage information relate with staff of HRM (besides may be have staff, lecture) |
| Salary Group | * Manage salary issue for school |
| Department | * Manage recruitment issues, hour work, training staff & lectures. |
| HR Group | * Manage human resource issues. |
| Account Department | * Manage accountant (salary for staff, lecture). |



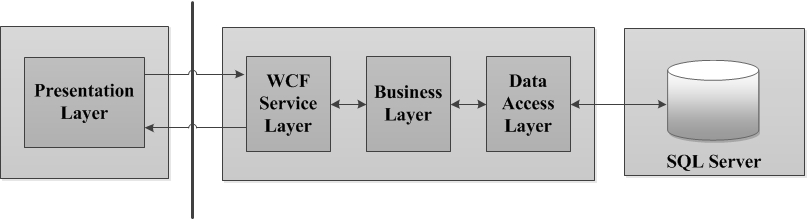
*Figure 2: System Context of HRM project*

1. View:

# 5.1 Static Perspective

# 5.1.1 Decompose in first level of HRM system

# 5.1.1.1 Primary Presentation



*Figure 3: First Decomposition of HRM system*

# 5.1.1.2 Element Catalog:

|  |  |  |
| --- | --- | --- |
| **Element** | **Type** | **Description** |
| **Presentation Layer** | Layer | This layer will contain the modules that related the interface (Silverlight). These will support for developing web component. In addition, this layer also contains MVVM (Model-View-ViewModel) object, data, and common. |
| **WCF Service Layer** | Layer | This layer will contain the security service. |
| **Business Layer** | Layer | This layer will contain the modules for the business implementing, including Application Façade, Common service, and Business Service |
| **Data access Layer** | Layer | This layer will contain the modules for mapping between Business layer and database, contains the Data Access object and entity framework. |
| **SQL Server** | Database | It is responsible for all object storage and database operation. |
| **Allow to use** | Relationship | Upper layers can use lower layers and reversly, lower layers can use layers above. |

# 5.1.1.3 Architecture background:

# 5.1.1.3.1 Design decision:

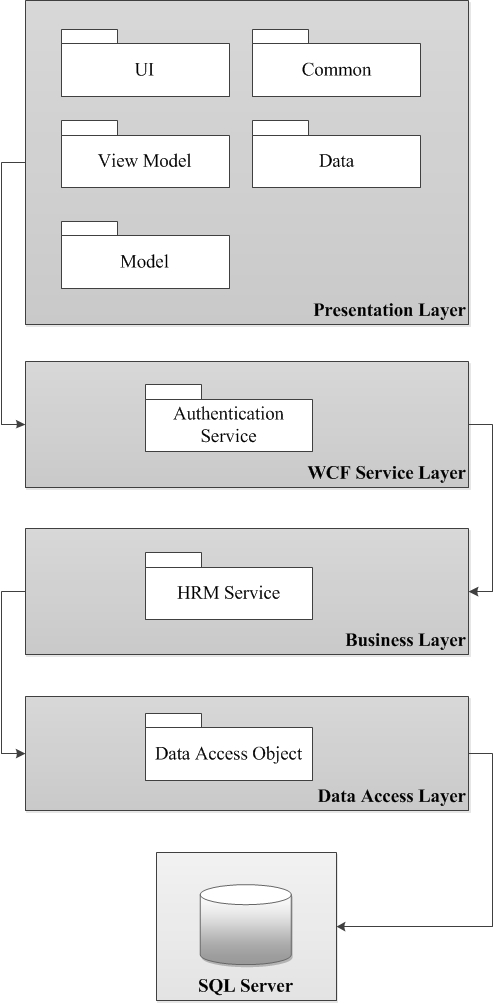
- Use n-tier structure for architect; including presentation tier, middle tier (service, business, data access), and data tier. It allows us to create a flexible and reusable application, easily modify or add a specific layer, rather than have to rewrite the entire application over

# 5.1.1.3.2 Design rationale:

|  |  |  |  |
| --- | --- | --- | --- |
| **Quality** | **Quality ID** | **Concern** | **Response measure** |
| Modifiability | QA.07 | Easy to change |  |
| Rationale:   * N-tier structure is separated into multiple tiers, including presentation tier, middle tier and data tier. It allows changing the interface, e.g. from the Silverlight to windows form application, or enabling easier adoption of new technologies that can be applied to a single tier without the requirement to redesign the whole solution. | | |
| Scalability | QA.06 | Easy to change |  |
| Rationale:   * Cause of separation between the tiers, so it is easy for Personal Information Management system to change from SQL Database Server to other database, e.g. MySQL. | | |

# 5.1.2 Decompose in second level of HRM system

# 5.1.2.1 Primary Presentation



# 5.1.2.2 Element Catalog

|  |  |  |
| --- | --- | --- |
| **Element** | **Type** | **Description** |
| **UI** | Module | This module represents the user interface of the application for HRM staff. |
| **Common** | Module | Contains the many classes for common using between the layers |
| **Data** | Module | Using for connecting to Entity Framework in Database |
| **View Model** | Module | This module reference the objects that are necessary for UI from presentation logic and data |
| **Model** | Module | This module packages the business logic and data. It is responsible for managing the data of application and ensure the it’s consensus |
| **Authentication Service** | Module | Enables us to authenticate users through a Windows Communication Foundation (WCF) service. Through the Authentication Service class, you can log users in, log users out, validate credentials, check authentication status, customize authentication, and set the authentication cookie. |
| **HRM Service** | Module | Business process objects allow us to implement HRM business rules and provide transaction support if required. |
| **Data Access object** | Module | Allow for connecting between Service layer and database. |

# 5.1.2.3 Architecture background

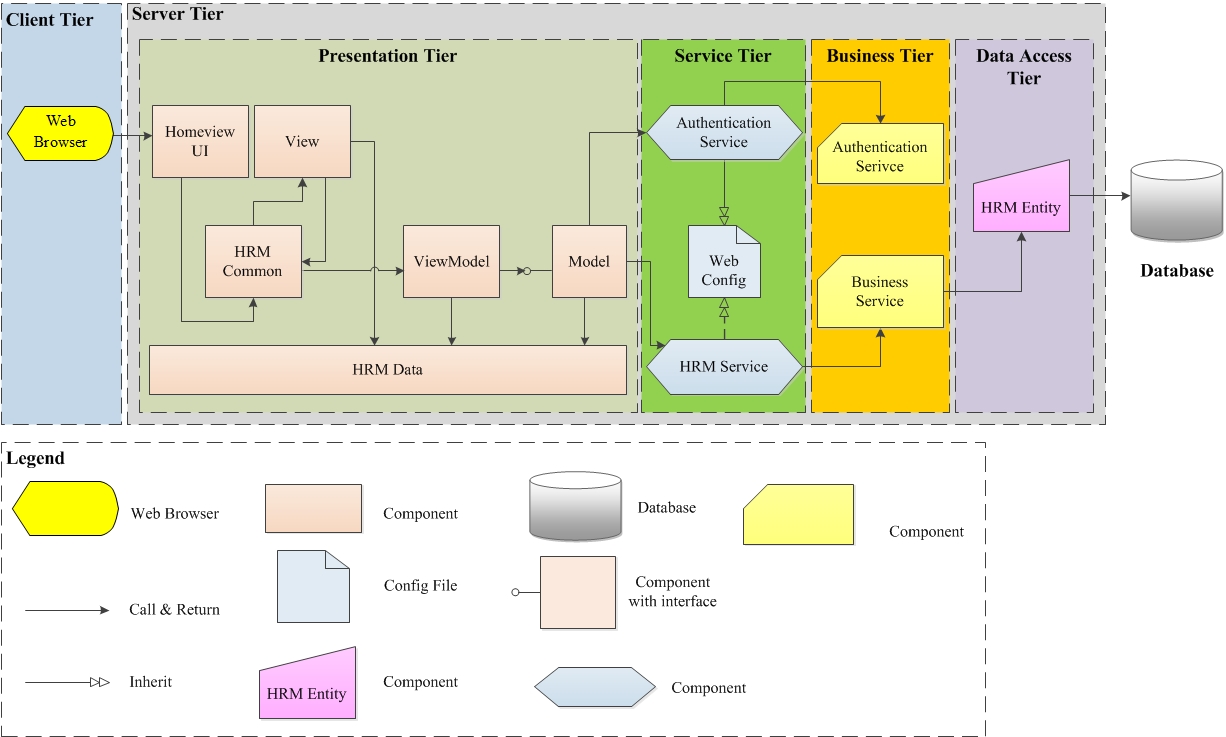
# 5.1.2.3.1 Design decision

- Using tactic “Maintain multiple copies of either data or computations”. Data access object is considered to be the cache that keeps the copies consistent and synchronize with SQL Server. It can help to increase the processing of speed and reduce the contention by access directly to Data Access layer without through the SQL Server

# 5.1.2.3.2 Design rationale

|  |  |  |  |
| --- | --- | --- | --- |
| **Quality** | **Quality ID** | **Concern** | **Response measure** |
| Modifiability | QA.07 | Easy to change |  |
| * Using MVVM model. MVVM model consist of 3 parts: Model, View, and ViewModel. Based on the separation, it allows us changing the GUI of application (change from Silverlight to windows form application (WPF) but not to impact to code behind, easily to test, maintain, and develop. | | |

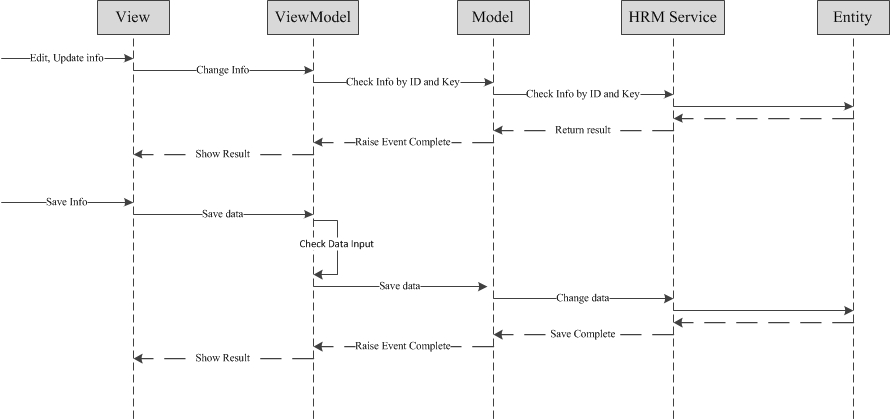
# 5.2 Dynamic Perspective



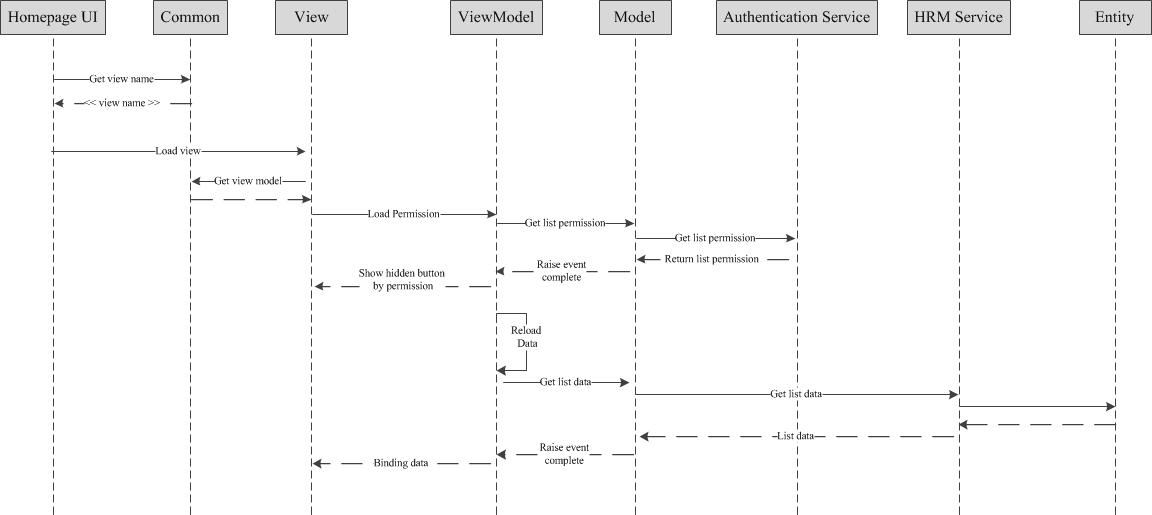
# 5.2.1 Element Catalog

|  |  |  |
| --- | --- | --- |
| **Element** | **Type** | **Description** |
| **Web browser** | Component | This component represents the user interface of the application running on a web browser. The client will enter the address and start the application on Web |
| **Home view UI** | Component | This is the main view of PIM Management’s system. This component defines the controls and actions to other views in system. |
| **HRM data** | Component | This is the data in client, this component will responsible for connecting with HRM Data in server tier |
| **Common** | Component | This component includes all common methods and common variables that will be consumed by all components in client tier |
| **Web Config** | File | This is the file that include the configuration of service in WCF Service tier. In more detail, it includes the hosting configuration |
| **HRM service** | Component | Service layer components provide access to HRM business logic in the business tier. The presentation component interacts with the service layer by passing messages to and from it over a communication channel. Business entities from the business tier are translated to and from service data structures within the service layer. |
| **Business Service** | Component | This component implement the core functionality of the HRM system, and encapsulate the relevant business logic |
| **HRM entity** | Component | This component is responsible for accessing to data that is hosted within the boundaries of the system, and data exposed by other back-end systems. In this scenario, a domain service is used to define business entities that are mapped to a database schema using a data mapper pattern. |

# 5.2.2 Behavior diagram



*Behavior for Editing, Update, Save information*

**

*Behavior for loading data to View*

# 5.2.3 Design decision

- Using Model-View-ViewModel (MVVM) pattern. MVVM pattern separate the business layer and the presentation from the user interface (UI). It means that it allows us changing the GUI of application but not to impact to code behind.

- Using WCF in Service tier. The WCF supports for exchanging the secure message based on security foundation, e.g. https, windows integrated security, or access control (use username and password for authentication)

- Using n-tier model for architect, including presentation, service, business, and data access tier. It allows us to create a flexible and reusable application, easily modify or add a specific layer, rather than have to rewrite the entire application over

- Using the Entity framework that allows the business layer working directly with objects without through database.

# 5.2.4 Design Rationale

|  |  |  |  |
| --- | --- | --- | --- |
| **Quality** | **Quality ID** | **Concern** | **Response measure** |
| Performance | QA.02 | Response time | The response time for updating and modifying the “Personal Information” will be less than 4 seconds and the number of transaction are 10. |
| Rationale   * The PIM system will use WCF service, so the performance will be increased because it can handle the large number of user transactions by processing multi-streams. * *Throttling behavior*: control the streams to keep the resource (memory, CPU, network, etc.) at healthy level * *Metadata behavior*: control the metadata publishing features of a service * *Transaction behavior:* allows rollback the transactions if the errors occur * *Concurrency behavior:* allow controlling the number of streams that can access to an object of service. * Entity framework is also promoting performance. It’s likely an object/relational mapping framework that allow the business layer working directly with objects without through database. | | |
| Security | QA.08 | Assign the permission |  |
| Rationale:   * The WCF supports for exchanging the secure message based on security foundation, e.g. https, windows integrated security, or access control (use username and password for authentication). * *Authorization:* allows assigning the permission. It means that the different user will have the different permission to show the data. It will be implemented in WCF through *PrincipalPermissionAttribute.* * *Auditing:* recording the security events into the log system of Windows OS (Windows event log). | | |